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ABSTRACT

The first phase of the process of developing a plan to promote increased use of educational technology by the instructors and students of the U.S. Navy's Surface Warfare Officers School (SWOS) in Newport, Rhode Island, began with a needs assessment which focused on the mission and organization of the school; the SWOS curriculum and the teaching styles, competencies, and preferences of SWOS instructors; and SWOS classrooms and laboratory facilities. Recommendations for equipping SWOS classroom and production areas cover video display, front screen projection, audio reinforcement/supplemental, video recording, graphics support (local production), student support/study, and instructor support. The SWOS instructors found that the proposed design plan for classrooms was compatible with their needs, had appropriate centralized control of equipment, met expectations, and was at an appropriate level of sophistication. Reactions to the proposed media centers were slightly less positive. Six prototype systems were completed, i.e., equipment was installed in one of each of four categories of classrooms and the prototype satellite and central media centers. After using one or more of the prototypes, the reactions of the instructors were generally favorable. It was concluded that instructional design procedures that are normally limited to the development of instructional materials or sequences are just as appropriate for a hardware-based project as they are for software development. Four tables and 17 figures are appended. (BBM)

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Title:

Instructional Development and Classroom Technology: Prototype Classrooms at the Navy's Surface Warfare Officers School

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Instructional Development and Classroom Technology: Prototype Classrooms at the Navy's Surface Warfare Officers School

In 1988, Iowa State University's College of Education and Media Resources Center (Ames, Iowa), contracted with Oak Ridge Associated Universities, Inc. (Oak Ridge, Tennessee) to develop a plan to promote the increased use of educational technology by the instructors and students of the United States Navy's Surface Warfare Officers School (Newport, Rhode Island). This paper is a description of the process used to develop, implement, and evaluate this plan which closely followed traditional instructional design procedures. First, a needs assessment was conducted. Second, a design plan was developed and critiqued, and third, prototype systems were installed and evaluated.

I. Needs Assessment

The needs assessment phase of this project had three components. First, it was necessary for program planners to gain an understanding of the organization of the Surface Warfare Officers School (SWOS). Second, the SWOS curriculum was evaluated to determine the applicability of different instructional technologies. Also, SWOS instructors' teaching styles, competencies, and preferences were identified. Third, SWOS facilities were analyzed so that recommendations could be made that were relevant to the classrooms and laboratories used by the SWOS instructors.

The Mission and Organization of the Surface Warfare Officers School

The Surface Warfare Officers School Command (SWOS) is located in Newport, RI. Its mission is to:

> Provide the Naval Surface Warfare Force, through a system of functional training, with officers professionally qualified to serve as effective naval leaders on surface warfare ships with the ultimate goal of Command-at-Sea.
>
> Serve as the focal point for development and integration of qualification standards and functional training in support of the established continuum of Surface Warfare Officer professional and billet specialty training.

The SWOS has five permanent buildings and five temporary buildings. These buildings serve as classrooms, as offices, and as laboratories. There are five schools at SWOS (figure 1):

1. The Division Officer Training School - This school prepares prospective Surface Warfare Officers for their first assignments by providing fundamental instruction in basic fleet training. This training emphasizes the knowledge and skills required to assume duties as a Division Officer, Officer of the Deck (in port), Combat Information Center Watch Officer, and Junior Officer of the Deck. Additionally, the course provides a foundation of knowledge in combat systems, propulsion engineering, and damage control.

2. The Department Head Training School - This school prepares mid-grade Surface Warfare Officers to confidently execute department head level duties aboard surface ships. Training addresses shipboard equipment in a systems fashion, stressing equipment interaction and interdependence. It also provides advanced training in managerial, operational, and technical areas needed to support an officer's assignments to a specific department in a given type of ship.

3. The Prospective Commanding Officer and Prospective Executive Officer (PCO/PXO) Training School - The PCO course's primary mission is to prepare line officers, eligible for Command-at-Sea, to properly execute that authority in surface ships. The training addresses the professional aspects of taking ships to sea and executing their battle functions as units in the tactical forces of the U.S. Navy. The school also addresses command responsibilities, ship tactics, techniques for evaluation and control of ships systems and equipment, current fleet policies and practices, and specialized information appropriate to the ship type to which students are ordered. The PXO curriculum is designed to provide the Executive Officer with an improved concept of supporting the Commanding Officer in controlling and evaluating the performance of the ship.

4. The Damage Control Training School - Courses in this school are to provide training in shipboard damage control procedures. In-depth study is provided in damage control administration and training, divisional administration, damage control equipment systems, and other damage control concepts.

5. The Engineering Specialty Training School - This school's courses of study prepare junior, division officer level, Surface Warfare Officers to execute their prospective Engineering Department Division Officer duties aboard surface ships. The training emphasizes technical and equipment details related to the respective propulsion plant systems and their operation. Instruction in the basic principles of electricity is emphasized. The training is developed toward an understanding of proper and safe propulsion plant operation.

The Curriculum and Instructor Analysis

In order to understand the media needs of SWOS instructors and curriculum, a process was followed that analyzed these needs. The goal of this process was to obtain as much information as possible about:

1. The current status of the instructional systems used at SWOS.
2. Instructors' expectations for media systems.
3. Curriculum activities that required media support.
4. Teaching procedures and styles requiring the use of media.

Information was obtained during two visits to SWOS. First, an initial visit was made to Newport and the Surface Warfare Officers School. The purpose of this visit was to familiarize the project director with SWOS, and to explain to SWOS officers the

procedures to be followed by the Iowa State University (ISU) team. A short visit was made to each of the five schools of SWOS. and brief discussions concerning media systems were held. Many classrooms, offices, and laboratories were also visited.

Next, two members of the ISU team visited SWOS to complete an in-depth evaluation designed to determine what media equipment items were needed to support the curriculum and instructors of SWOS. This visit was organized to include five activities: in-depth discussions with SWOS officers and staff, a written SWOS instructor survey, an evaluation of the SWOS curriculum, class observations, and a solicitation of media equipment requests from the officers and staff of SWOS.

Additionally, a comprehensive facilities review was completed. This review included an examination of SWOS classrooms, offices, and laboratories. It also included an inspection of floor plans and room schematics.

DISCUSSIONS were held between the needs assessment team and selected SWOS officers. These discussions were of two types - general ones with central SWOS support staff, and more specific discussions with officers from each of the five SWOS schools. These discussions were organized to obtain as much information as possible about the media needs of SWOS. The following conclusions were derived from these discussions:

1. Most teaching conducted at SWOS was teacher-centered. In other words, most instruction was "lecture with demonstrations". The teaching varied somewhat between the SWOS schools, but most classroom instruction was primarily lecture with teacher-led discussions.

2. Instructor background and experience with media equipment was varied. Some instructors were competent, some were inexperienced, and most were self-taught.

3. Instructors prepared their own teaching materials. Many stated that they would have liked to have been able to prepare more sophisticated teaching materials, assuming production techniques were easy to learn, and production equipment and facilities were readily available.

4. Instructors stated that they would like to have all classrooms equipped with a similar configuration of support equipment so teaching would not have to be modified depending on which classroom an instructor was assigned to.

5. Instructors felt the following four kinds of audio-visual equipment were necessary: overhead projectors, slide projectors, 16mm motion-picture projectors, and video displays. They also felt that computer display or projection was important.

6. Training in teaching was adequate, but training in the use of media was minimal. Most instructors had learned on their own, and expressed concern about the installation of overly complex classroom audio-visual equipment. They felt equipment should be durable, reliable, accessible, and easy to use.

7. Instructors requested equipment for video recording of class sessions for student review and for instructor self-evaluation.

The next component of the research visit was the INSTRUCTOR QUESTIONNAIRE. This seven-question survey was distributed to SWOS officers. Eighty-five questionnaires were returned (figures 2 & 3).

As part of this questionnaire, instructors were asked "open-ended" questions about the need for classroom equipment and media production facilities. A variety of responses were made. For example, several SWOS instructors mentioned that they would like to have the school['s chalkboards replaced with dry-marker metal boards. Also mentioned was the need for "remote control" of projection equipment. Several instructors felt that computers should be placed in classrooms, and computer projection equipment should be available.

When asked about media production, 94% of the SWOS instructors who responded to the questionnaire felt that additional media production support was needed. Traditional graphics production was mentioned often, as was a need for video production equipment. The VHS format was considerably more popular than any of the other video formats. Transparency production was mentioned most often as a need that, if met, would have the most immediate impact on teaching.

The questionnaire results made it fairly obvious that SWOS instructors wanted improved classroom audio-visual systems, and that they felt additional media production was critical to their success as teachers. No negative comments about the need for improved audio-visual systems were given.

A CURRICULUM EVALUATION was also conducted during the research visit. A number of curriculum plans from each of the SWOS schools were reviewed. The results of this review supported many of the generalizations obtained during other phases of the visit. Specifically, the review of the curriculum generated these observations:

1. Instruction was based on goals and objectives, with student learning outcomes clearly stated.

2. Student guides were used throughout the SWOS curriculum. Often, students followed along in their guides during teaching.

3. Instruction was teacher-centered. Teachers lectured to present information, and discussed with students to clarify key points.

4. During classroom instruction, instructors often used materials produced directly from student guides. Specifically, charts, drawings, and graphs were copied from student guides and converted into transparencies or 2" by 2" slides.

CLASS OBSERVATIONS were used on several occasions to verify the conclusions derived from other portions of the research visit. Several generalizations were worthy of note:

1. All instructors observed were knowledgeable in the topic they were presenting and were skillful lecturers.

2. All instructors who were observed used instructional materials during their lectures. Transparencies were used most often, followed in frequency by real objects and slides.

3. Students seemed interested during the lectures and inquisitive during discussions. In almost all classrooms observed, students were using a number of handouts (charts, maps, drawings, study guides) during lectures. Desks and table tops were used by students to spread these materials in front of them so they could be easily referred to during lectures and discussions.

4. In a number of instances instructors were forced to use audio-visual equipment inappropriately. This was because screens were mounted incorrectly, pieces of projection equipment were place inappropriately, or lenses on projectors were not of the proper focal length. In most cases this was not the fault of the instructor, but was due to the configuration of the classroom or the limitations of the audio-visual equipment available to them.

5. Audio-visual equipment pieces were a critical component of instruction. Instructors used equipment and seemed desirous of making greater use of equipment.

REQUESTS for audio-visual equipment and support materials were supplied to the ISU team by SWOS officers and staff. These requests were in the form of lists of equipment and copies of brochures. These specific requests were merged with the more general information obtained during the other phases of the needs assessment visit. Most notable were the following requests:

1. Requests were made for media production equipment so instructors could easily and efficiently prepare instructional materials.

2. Requests were made for more video display/projection equipment in the VHS 1/2" cassette format.

3. Requests were made for computer display/projection equipment so computer output could be used during classroom presentations.

4. Requests were made for newer, easier to use, 16mm projectors.

5. Requests were made for computer software so instructors could prepare graphics materials for classroom use. Macintosh and "Macintosh look-alike" systems were requested most often.

The Facilities Analysis

A review of all current SWOS classrooms, support spaces, and simulation facilities was conducted using on-site visits and an examination of floor plans. Most classrooms and support spaces were observed during instructional use, as well as during non-usage time. The intent of this facilities review was to identify and categorize the basic types of instructional environments found at SWOS. Also, the review visit was to identify the physical and structural restrictions that influenced the placement of equipment. The

results of the facilities analysis were organized into nine categories:

1. Physical layout (size, shape, and seating orientation)

The various SWOS classrooms were grouped into five basic physical layout patterns (four basic categories and a fifth category to cover one-of-a-kind facilities). The four basic patterns and the fifth miscellaneous grouping identified were (see figure 4):

CATEGORY 1. A rectangular space with the front of the room oriented on the longest dimension. Generally, there were two entrances with windows on the opposite wall. The rooms seated approximately 45 at fixed desks/tables.

CATEGORY 2. A nearly square format space with two fixed seating areas on either side of a structural column(s) located near the front of the room. One entrance was located at the rear of the space and windows were on one or both sides of the room. The rooms seated approximately 30-35 in small desks.

CATEGORY 3. A square format with small dimensions (approximately 16′ x 18′) with one seating area. One entrance was located at the rear or front of the space with windows on one wall. The rooms seated approximately 10-15 at movable tables or desks.

CATEGORY 4. A rectangular format space with standard classroom dimensions (approximately 30′ x 40′) with two seating areas and with the front of the room oriented on the narrow dimension. The rooms had one or two entrances with windows on one wall. The rooms seated approximately 30-35 at movable tables.

CATEGORY 5. Miscellaneous formats, ranging from a large, three-bay auditorium to small simulation (6′ x 8′) training facilities. Included were a variety of sizes and shapes which varied dramatically from categories 1, 2, 3, or 4. Orientation and seating patterns also varied.

2. Lighting and lighting control

In general the lighting in the SWOS instructional spaces was recessed fluorescent fixtures that were controlled in banks (two or three) by on/off switches near entrance doors. A few rooms had some fixtures or additional lights on dimmer controls. Most spaces with windows had hand operated darkening drapes for control of natural light.

3. Projection screens or surfaces

All SWOS classrooms had one to three screens located on keystone brackets. Many were mounted approximately 12-15" from the ceiling and oriented parallel to the chalkboards. The screen sizes varied from 70" to 96" and were generally of the matte surface type. Mounting location and front orientation varied from room to room.

The viewing angle and screen orientation of the SWOS classrooms varied greatly. Generally, the screens did not allow for the proper, optimum viewing of screen images by all students.

The ceiling height of SWOS classrooms varied from less than the normal 8' height to 14' high in specialized areas. Generally, the ceiling height was determined by ceiling tile of the T-bar suspended acoustic type.

All SWOS classrooms had chalkboard surfaces located at the front of the room. Many also had side-mounted boards. The type of boards varied from blank slate to green board surfaces, all of which utilized chalk materials. Tack or mounting boards were located in some of the classroom spaces.

4. Electrical power

Most SWOS classrooms had electrical outlets distributed on all wall surfaces at the normal level. Only a few spaces had additional floor outlets near the room fronts for overhead projector usage. None of the SWOS spaces had power outlets located in ceilings or at work counter levels.

5. Equipment controls and sound

None of the SWOS classrooms had front-to-rear wiring or conduits for projection equipment controls. A few spaces had "temporary" ceiling-hung slide projector remote control cables.

Sound amplification or enhancement existed in only a few of the larger SWOS facilities.

Many Division Officer School classrooms had been wired for distribution of television and video. These spaces had one or two small 15" monitor/receivers mounted in the front of the room.

6. Structural

Some SWOS classrooms had structural columns located within the viewing and seating areas. These structural members limited projection and instructional activities.

7. Audio-visual equipment

The audio-visual equipment inventory of SWOS was dated, a "mixed-bag" of makes and models, and limited to primarily front screen projection items. Many of the overhead projectors had "standard" angle lenses and did not allow for the projection of properly sized images in the existing classrooms with their limited front-of-the-room operating space. Video equipment was of various models and formats, also. Only one "green screen" video projector in a specialized computer laboratory was in use.

8. Local production support

Similar to the audio-visual equipment, the local graphics and other media production equipment was dated, of mixed varieties, and unconnected in approach. The capabilities and availability of production materials and equipment varied from school department to department and from office unit to office unit.

9. A summary of facilities limitations and characteristics observed during review and analysis indicated:

a. Varieties of physical layouts

Four basic classroom layouts existed and each (along with the miscellaneous layouts) required individual audio-visual plans.

b. Ceiling height

The limited vertical height in all SWOS classrooms was a restricting factor in designing for the overhead viewing of visual instructional materials. In most rooms only 48" or less was available for unobstructed viewing of overhead images. Two options existed in most spaces: (1) structural ceiling height changes and/or (2) design of a media system not dependent upon large overhead visual images. Some rooms/spaces needed larger, electrically operated, and ceiling recessed screens.

c. Structural

Some classrooms and specialized spaces had structural members or columns in their seating and viewing areas.

d. Orientation

Several of the SWOS classrooms had their front orientation on the longest dimension of the room.

e. Standardization

There was a lack of standardization in the type of equipment and processes available for using and producing audio-visual presentations at SWOS. Much of the existing equipment was out-dated and in need of replacement.

f. Lighting control

The arrangement of the lighting fixtures, controls, and window darkening was generally found to be adequate.

Some areas required slight modification of the light switching of the room(s). Additional switches and dimmer controls needed to be added for instructor convenience.

g. Audio

There was a general lack of equipment and systems to produce or playback audio in the SWOS classrooms. These needs included audio amplification of spoken or recorded sound, enhancement of the sound portion of videos and films, and the ability to record sound in the rooms.

Acoustically, the SWOS instructional spaces were adequately treated with drapes and acoustic ceiling tile to allow "normal" classroom sound recording and playback.

II. The Design Plan

A. The Design Considerations

Based on the data collected during the needs assessment phase of this project, the following concepts were identified and used to develop the design proposal:

The Prototype Concept - Prototype is defined as the first or primary type of anything. Prototypes are models or originals. A prototype classroom would be one equipped with audio-visual systems before other classrooms were similarly equipped. At the Surface Warfare Officers School there are dozens of classrooms. Before any single plan for equipping these classrooms with audio-visual equipment is implemented, it should be first tested as a prototype.

The design plan had two major purposes. First, it contained recommendations for how SWOS classrooms and production areas should be equipped. These recommendations were both general and specific, and were used as the basis for the installation of systems in all SWOS classrooms. An important second purpose of this plan was its recommendation for the installation of prototypes which were to be installed, demonstrated, and tested before other classrooms were similarly equipped. The results obtained from this prototype process were used to validate the general recommendations of the plan.

The 80% - 20% Concept - Very early in the planning process, it became apparent to all concerned that recommendations needed to satisfy the audio-visual needs for not only the present situation at SWOS, but also for the predictable future needs of SWOS. As a result of this realization, the "80% - 20% Concept" was formulated. Stated generally, this concept implied that 80% of the recommendations contained in the plan would be to meet the current requirements of the SWOS curriculum and faculty. Specifically, this meant that more efficient methods of, and equipment for, slide, film, video, and transparency projection would be recommended for installation.

It was also apparent that new and different kinds of instructional technology support for SWOS were needed so that the curriculum and the instructional strategies were not constrained by the limitations of the available media. Twenty percent of the support proposed by this plan was to meet predictable future needs. Examples of this kind of

support were the availability of easy-to-use computer projection/display hardware, and access to video production equipment.

Audio-visual systems should not dictate teaching style or curriculum offerings. Conversely, a lack of systems should not limit the techniques used by a teacher, or the kinds of activities offered to students as part of the curriculum. The "80% - 20% Concept" was an attempt to strike a balance between current and future needs.

The Design Recommendations

Based upon the design needs identified during the needs assessment phase of the project, seven kinds of capabilities were identified as necessary. These needs are listed below:

-- Video display

- videocassette playback
- computer projection/display (composite, RGB, CGA, and EGA capability)

-- Front screen projection

- overhead transparency projection
- slide projection
- 16mm projection
- screen placement
- lighting requirements control

-- Audio reinforcement/supplemental

- reinforcement of the audio portion of video and films
- public address amplification/recording
- auxiliary audio playback

-- Video recording

- session recording
- instructor analysis
- "minor" production

-- Graphics support - local production

- transparency production
- computer graphics/simulation development
- slide production
- scanning of documents

-- Student support/study

- video playback and viewing
- printed material study
- micro-forms use

-- Instructor support

- instructor office use
- networking with other areas
- classroom presentation development

There were five plans written, one for each of the five categories of classrooms. The five presentation systems each allowed for the display of composite, EGA, RGB, and CGA video images from a variety of sources, the display of standard projected images, audio playback and/or amplification, and the potential for overhead and rear-of-room video recording. All the presentation systems utilized modular components, hard (fixed) wired remote controls, mobile projection carts/cabinets, a fixed control console, and proper screen placement for optimum viewing within the room layout limitations. Each category of rooms was designed to accept video recording cameras at two locations (overhead and rear-of-the-room) using a portable recording control console.

Media Production Centers - Instructional materials used in teaching are obtained in one of two ways - commercially prepared materials can be purchased, and materials can be produced by persons who will use them. Commercially prepared materials are usually of a high technical quality and are preferred by many educators, assuming that they are relevant to the needs of the curriculum. However, commercially prepared materials have several disadvantages associated with their use. First, they are expensive to produce and to purchase. Second, because developers of commercial teaching materials normally want to sell their materials to the largest possible number of users, they tend to produce general materials. This often means that the items may not be exactly "on target" for specific curriculum objectives. Last commercial materials are often difficult to revise.

Many professional educators now believe that developing and using locally produced materials is the most effective and efficient way to mediate instruction. Optimally, instructors should have support staff available to assist them. These staff persons produce graphics materials, develop videos, and carry out all other clerical functions needed by the teaching staff. Unfortunately, most institutions do not have the financial resources to hire support staff. Instead, professional educators advocate the installation of a media center in all schools. This media center would be equipped with easy-to-use production equipment, but with few people. The regular teaching staff would use the media center to produce their own classroom materials, rather than to have others produce media for them.

A local media production center is a facility where instructors can easily design, produce, and revise a variety of instructional materials. A media production center should be equipped with easy-to-use equipment and materials that permit the instructor to quickly and professionally develop high quality teaching media. Production centers should be located as close to instructors as possible, and the more often a technique is used, the

more convenient it should be.

Two kinds of media production centers were needed at SWOS. One large, centrally located center was needed to provide the majority of support to most instructors. A second, satellite media center was needed at the Division Officers School.

1. The Satellite Media Production Center (SMPC)

   The first media production center at SWOS was a prototype satellite center located in the Division Officers School. This center had the following types of production capabilities:

   a. Manual and mechanical production of graphic materials

   b. Computer production of graphic materials

   c. Simple photographic production

   d. One-camera video production and editing

Additionally, the SMPC needed equipment so that instructors could preview instructional materials that had been produced or for reviewing commercial materials.

2. Central Media Production Center (CMPC)

The primary media production center, located centrally, had the same capabilities as the SMPC. Additionally, it had the following capabilities.

   a. Film to video transfer

   b. Copy machine with enlarging and reducing capabilities

   c. Computer-based instructional material production using various computer operating systems

   d. Video format dubbing

C. The Design Plan Evaluation

The design plan evaluation was submitted to SWOS instructors for their review. A formal presentation was given, and the specific recommendations for prototype installations were made. After the presentation questionnaires were distributed to obtain opinions about the proposal. Part 1 of the questionnaire asked questions about the proposed classroom installations. Part 2 contained questions about the prototype media centers.

Results (see tables 1, 2, & 3) indicated that the evaluators thought the plan for the classrooms was compatible with SWOS needs, had appropriate centralized control of equipment, and met expectations. The level of sophistication of the system was

considered "about right". The evaluators were slightly less positive about the proposed media centers. However, ratings were generally very favorable.

III. Prototype Installations

Because evaluations were so positive, few modifications to the proposed plan were made. Only minor alterations to the recommendations, such as the placement of equipment in the classroom media control system, were made.

Six prototype systems were completed. One of each of the first four categories of classrooms had equipment installed in them. Also, the prototype satellite and central media centers were equipped.

A. Category 1 (Classroom (figures 5 & 6)

The prototype classroom system design for category #1 classrooms incorporated the general design functions as follows (see figures 7 - 11):

1. Displaying video images using a ceiling mounted multi-scan projector, supplemented by the use of two, front-corner-of-room mounted video monitors.

2. Displaying film, slide, and overhead transparency images using a rear-of-room mobile projection art and front-of-room instructor workstation.

3. Providing for audio reinforcement using a supplemental public address amplifier/mixer, sound input panel and player, auxiliary wall speakers, and the video monitor's built-in sound systems.

4. Allowing for video display and recording using a two-camera recording system (overhead and rear-of-the-room locations) with an instructor controlled console. The system (cameras and console) was designed to be partially mobile. The camera mounts and wiring were fixed in each classroom space, but the cameras and control console were a portable unit that could be moved from classroom to classroom.

5. Providing for instructor control and operation of all audio-visual equipment using a three part (audio, video playback, and video recording) console system. All power, lighting, and equipment controls were built into the console and wired permanently to the A-V items or patch boxes at the equipment sites.

6. Providing three screens, properly mounted and angled, to allow viewing by as many students as possible.

B. Category 2 Classroom (see figure 12)

The presentation system plan for category #2 classrooms incorporated the general design functions as follows:

1. Displaying video images using three video monitors (two front-corner mounted and one mounted on the center structural column).

2. Displaying film, slide, and overhead transparency images using equipment mounted in a cabinet on the center structural column, and a cart-mounted overhead projector.

3. Providing for audio reinforcement by using a public address amplifier/mixer, sound input panel, audio player, auxiliary wall speakers, and the video monitor's sound system.

4. Allowing video display and recording by using a two-camera recording system (overhead and rear-of-the-room locations) with an instructor controlled console. The system (cameras and console) was designed to be mobile with the camera mounts and wiring fixed in each classroom space and the cameras and control console a portable unit that could be moved from classroom to classroom.

5. Providing for instructor control and operation of all audio-visual equipment by the use of a three part (audio, video playback, and video recording) console. All power, lighting, and individual equipment controls were built into the console and wired permanently to the individual A-V items or patch boxes.

6. Providing two screen surfaces, properly mounted and angled, to allow efficient viewing by as many students as possible.

C. Category 3 Classroom (see figures 13 & 14)

The prototype presentation system plan for the category #3 classrooms incorporated the general design functions as follows:

1. Displaying video images (composite - EGA) using a front-corner mounted video monitor.

2. Displaying film, slide, and overhead transparency images using a rear-of-room mobile projection cart and front instructor workstation.

3. Providing limited audio reinforcement and playback using a sound input panel, audio player, and the video monitor's sound system.

4. Allowing for video display and recording by using a two-camera recording system (overhead and rear-of-the-room locations) with an instructor controlled console. The system (cameras and console) was designed to be mobile with the camera mounts and writing fixed, and the cameras and control console as a

portable unit.

5. Providing for instructor control and operation of all audio-visual equipment by using a three part (audio, video playback, and video recording) console. All power, lighting, and individual equipment controls were built into the console and wired permanently to the individual A-V items or patch boxes.

6. Providing two screen surfaces, properly mounted and angled, to allow viewing by as many students as possible within the limits of the physical environment.

D. Category 4 Classroom (see figure 15)

1. Displaying video images using two, front-corner mounted, video monitors.

2. Displaying film, slide, and overhead transparency images by using a rear-of-room mobile projection cart and front-of-room instructor workstation.

3. Providing for audio reinforcement by the use of a public address amplifier/mixer, sound input panel, audio player, auxiliary column wall speakers, and by using the video monitor's sound system.

4. Allowing video display and recording by using a two camera recording system (overhead and rear-of room locations) with an instructor controlled console located in the front of the classroom. The system (cameras and console) was designed to be mobile with the camera mounts and wiring fixed and the cameras and control console a portable unit that could be moved from classroom to classroom.

5. Providing for instructor control and operation of all audio-visual equipment by using a three part (audio, video playback, and video recording) console. All power, lighting, and individual equipment controls were built into the console and wired permanently to the individual A-V items or patch boxes.

6. Providing two screen surfaces, properly mounted and angled, to allow efficient viewing by as many students as possible.

E. Satellite Media Production Center (SMPC; see figure 16)

One concern expressed numerous times by the officers and staff of SWOS was the need for convenient, easy-to-use, media production centers where they could prepare professional appearing instructional materials. In order to meet the needs expressed by SWOS officers for media support, two prototype media production centers were installed, demonstrated, and evaluated.

The SMPC had materials production and preview capabilities. Production capabilities included those for graphic, computer, photographic and video development. Equipment items for previewing media were also installed.

1. Production Capabilities - Production of graphic materials required the installation of the following types of equipment:

a. Mechanical letting machine
b. Layout table
c. Thermal transparency maker
d. Slide previewing and tracing light table
e. Laminator

The following computer equipment was included in the SMPC:

a. A computer with "user-friendly" software
b. A scanner for digitizing printed materials such as charts and line drawings
c. A laser printer

The following photographic equipment was placed in the SMPC:

a. Single lens reflex camera
b. Copy stand (for making slides from flat pictures)

The following video equipment was placed in the SMPC:

a. Portable VHS video recorder with camera
b. VHS 1/2" videocassette editing system

2. Preview Capabilities:

a. A carousel slide projector
b. Overhead projector
c. A VHS 1/2" videocassette player with TV

F. SWOS Central Media Production Center (CMPC; see figure 17)

This center was the primary media production center for SWOS.

Capabilities - The CMPC had five categories of capabilities. First, it was a media production center for SWOS instructors. It had the same capabilities as the Satellite Media Production Center. Second, it contained one-of-a-kind media production items that were needed but not routinely used. For example, video equipment in the non-domestic PAL and SECAM formats were kept in the CMPC. Third, "back-up" equipment was kept here. Fourth, the CMPC was where software and supplied needed by SWOS instructors was stored. Last, the CMPC contained a study area for SWOS students.

G. Prototype Evaluation

Installation of the six prototypes was completed by Iowa State University staff during three visits to SWOS. When all systems were fully operational, a formal presentation

of the systems' capabilities was made to SWOS commanding officers. At the conclusion of this presentation, the evaluation of the newly installed prototypes began. Officers were given a questionnaire to complete after they had a chance to use one or more of the prototypes. These questionnaires were collected several weeks later. Generally, results were favorable (see table 3). Suggestions for improving the prototypes included:

1. Relocate equipment controls in the console so they were easier to use.

2. Use of wireless microphones was not a good idea; use a microphone with a cable or do not use at all.

3. Install 5 1/4" disk drives in the prototype system's microcomputers. 3 1/2" disks were not installed in any of the command's other computers.

4. Put a dot matrix printer in the media centers.

5. Add a spotlight in classrooms to illuminate overhead camera work.

Generally, the evaluation indicated that SWOS officers were satisfied with the process followed and the equipment installed during this project.

Summary

Instructional design (ID) procedures were followed during this project. Traditionalists normally limit the application of the ID process to the development of instructional materials, or instructional sequences. This project applied ID procedures to the problem of providing appropriate hardware support for the five schools of the Navy's Surface Warfare Officers School. It was found that the design prescriptions of ID theory were just as appropriate for a hardware-based project as they were for software development.

Figure 1

Surface Warfare Officers School Command Organization

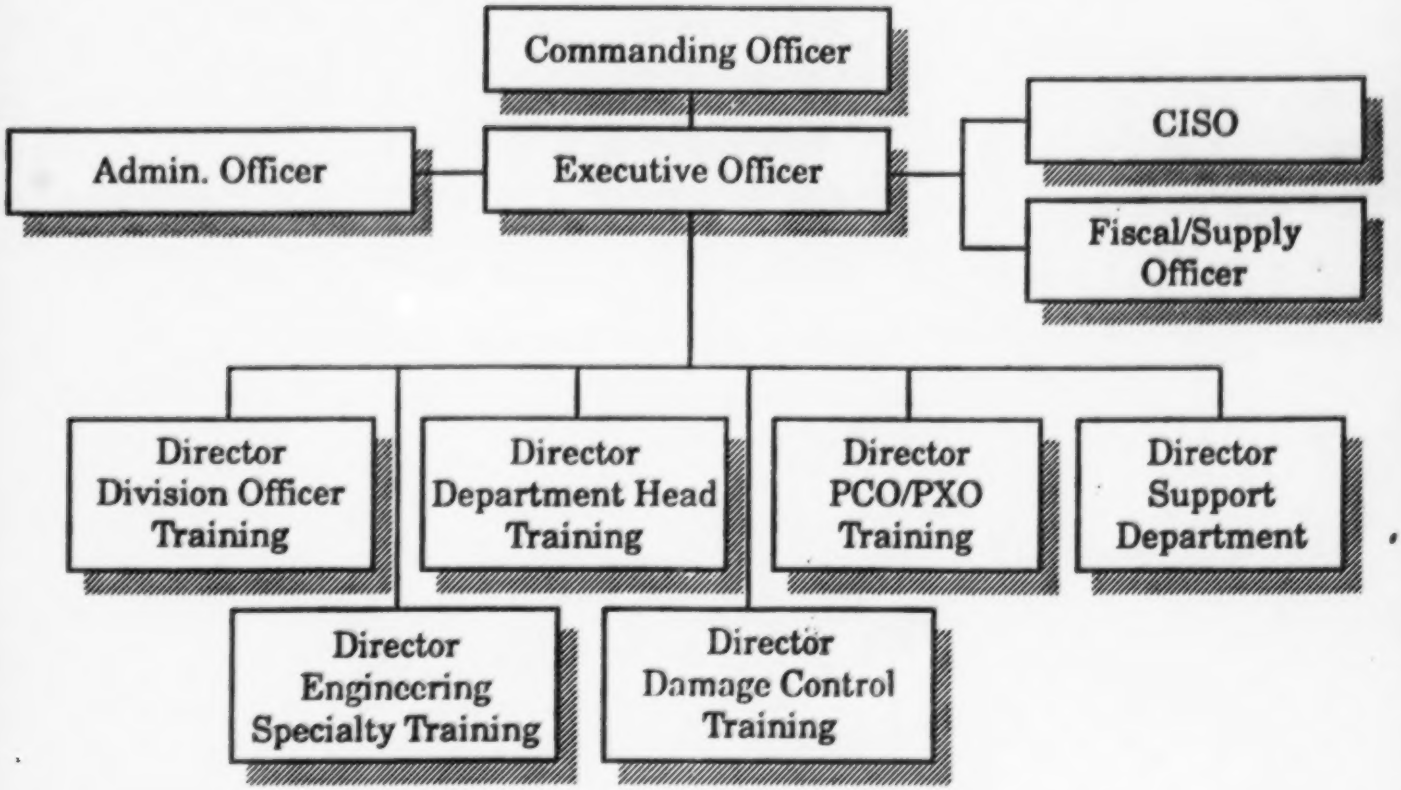
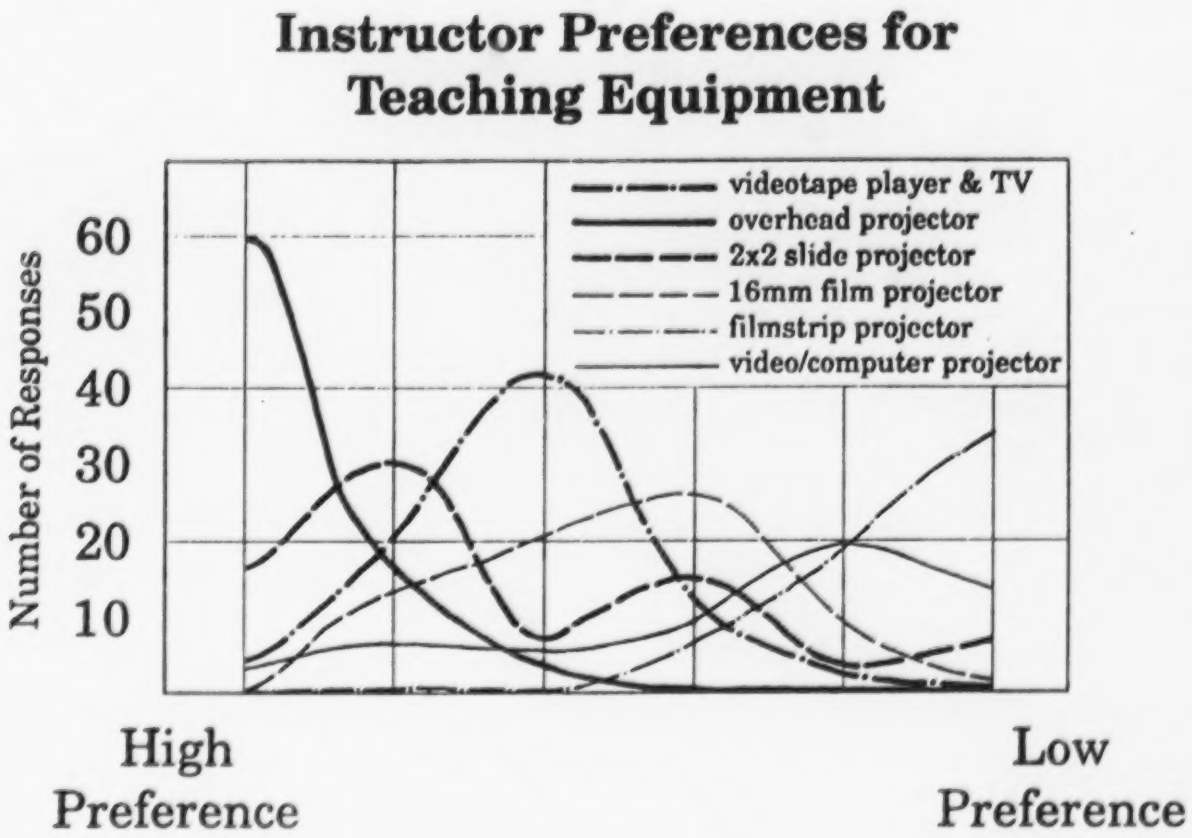


Figure 2

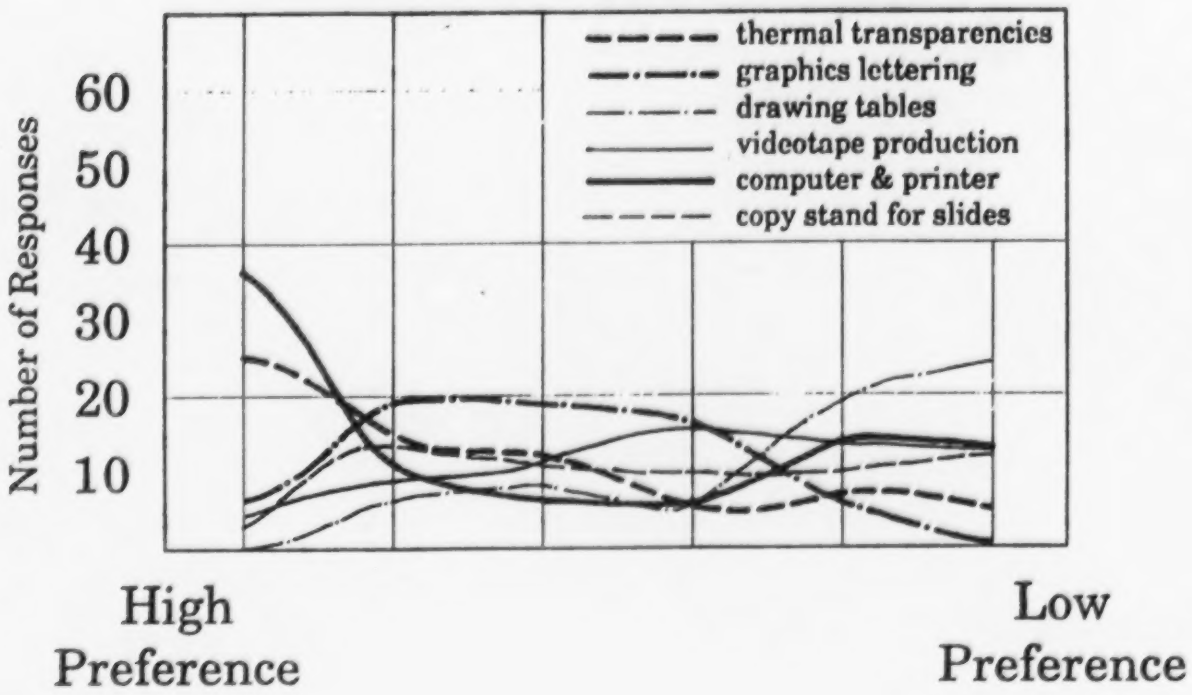


Rank Order of Most Important Teaching Equipment

	Rank					
	1	2	3	4	5	6
videotape player & TV	4	20	42	12	3	0
overhead projector	60	17	4	1	1	0
2x2 slide projector	16	30	7	15	3	6
16mm film projector	0	14	20	26	14	2
filmstrip projector	0	1	0	7	19	34
video/computer projector	3	7	6	9	20	14

Figure 3

Instructor Preferences for Media Production Equipment

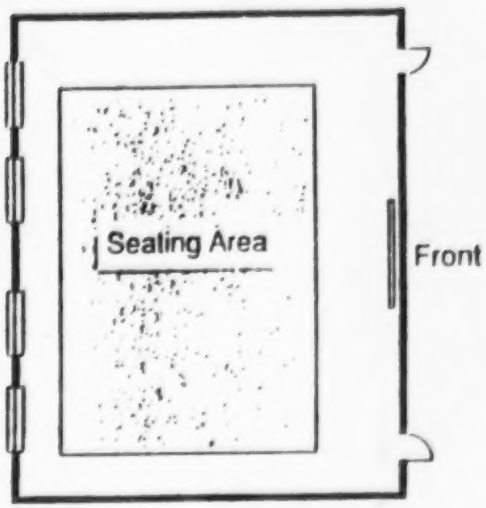


Rank Order of Most Important Media Production Equipment

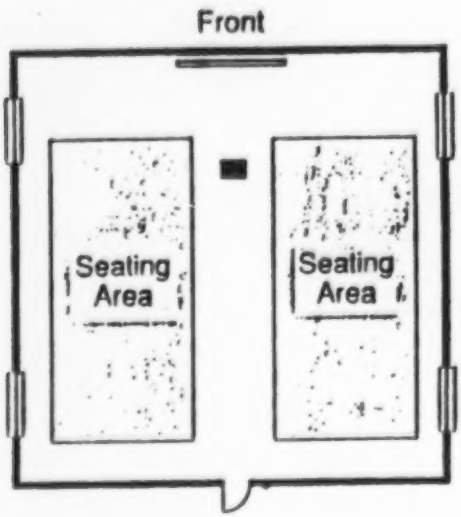
	Rank					
	1	2	3	4	5	6
thermal transparency production	25	15	12	5	7	5
graphics lettering machine	6	19	19	18	6	1
drawing tables	0	6	8	5	19	24
videotape production equipment	4	9	11	16	14	13
computer and printer with graphics	36	11	7	6	14	13
copy stand (single lens reflex for copying pictures onto slides)	3	14	11	10	10	12

Figure 4

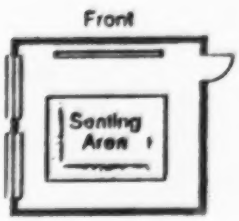
CATEGORY 1



CATEGORY 2



CATEGORY 3



CATEGORY 4

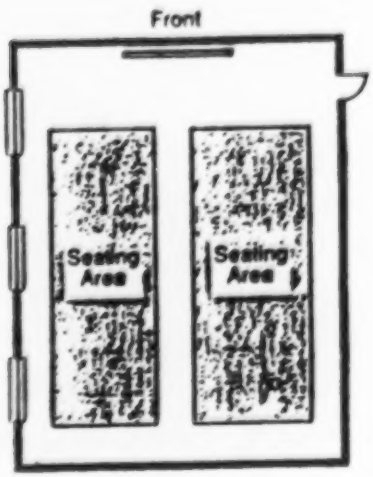
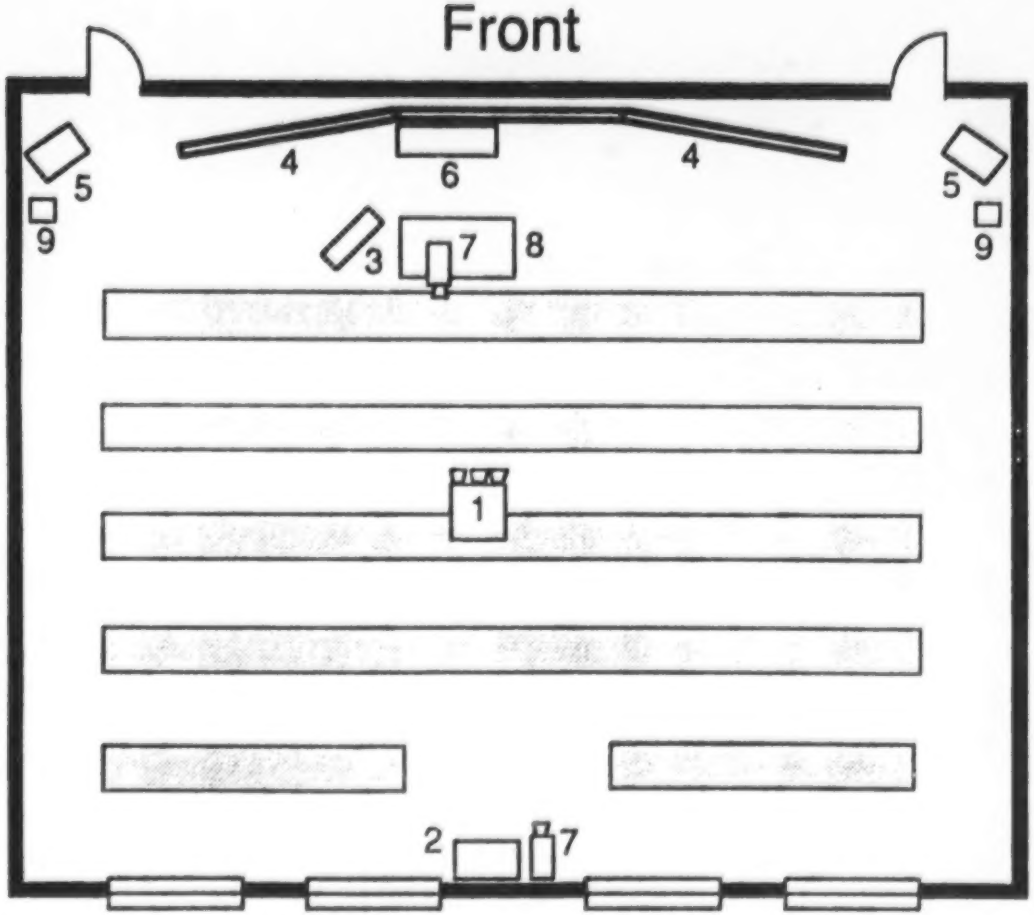


Figure 5

Category #1: Classroom



1. Video Projector
2. Slide/film Projection Console
3. Overhead Projection
4. Screens, 8' & 70"
5. Video Receiver/monitor
6. Control Console, 19":
   - sound/PA
   - slide/film remote
   - video proj. remote
   - video camera controls
   - VCR
   - computer
7. Video Camera Locations
8. Instructor Work Station
9. Audio Speakers

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Figure 6

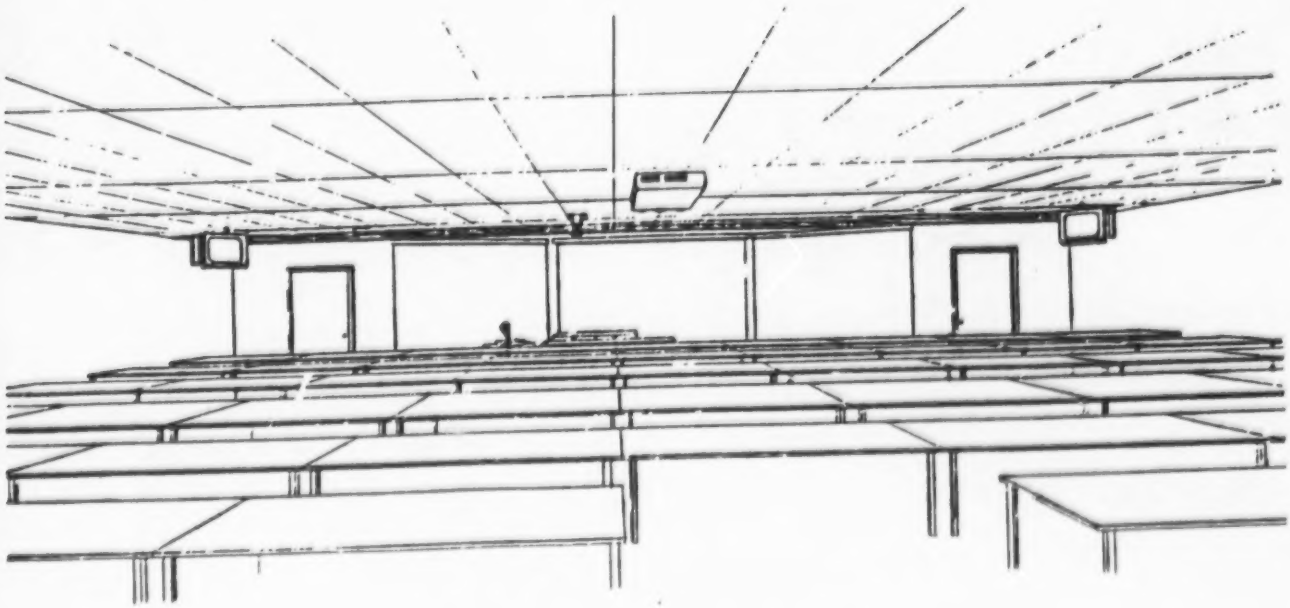


Figure 7

2.1 INSTRUCTOR CONSOLE - COMPONENTS

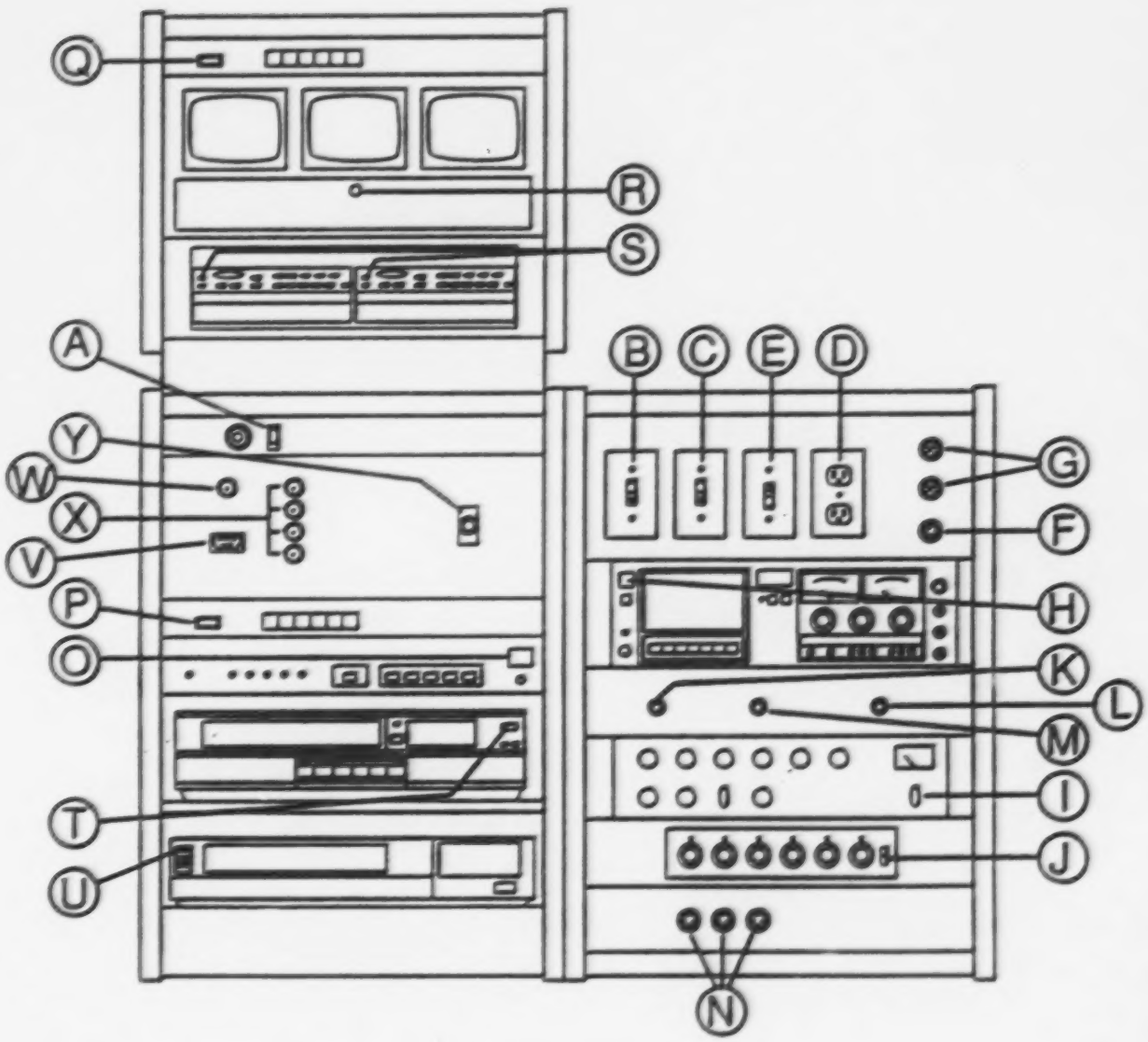
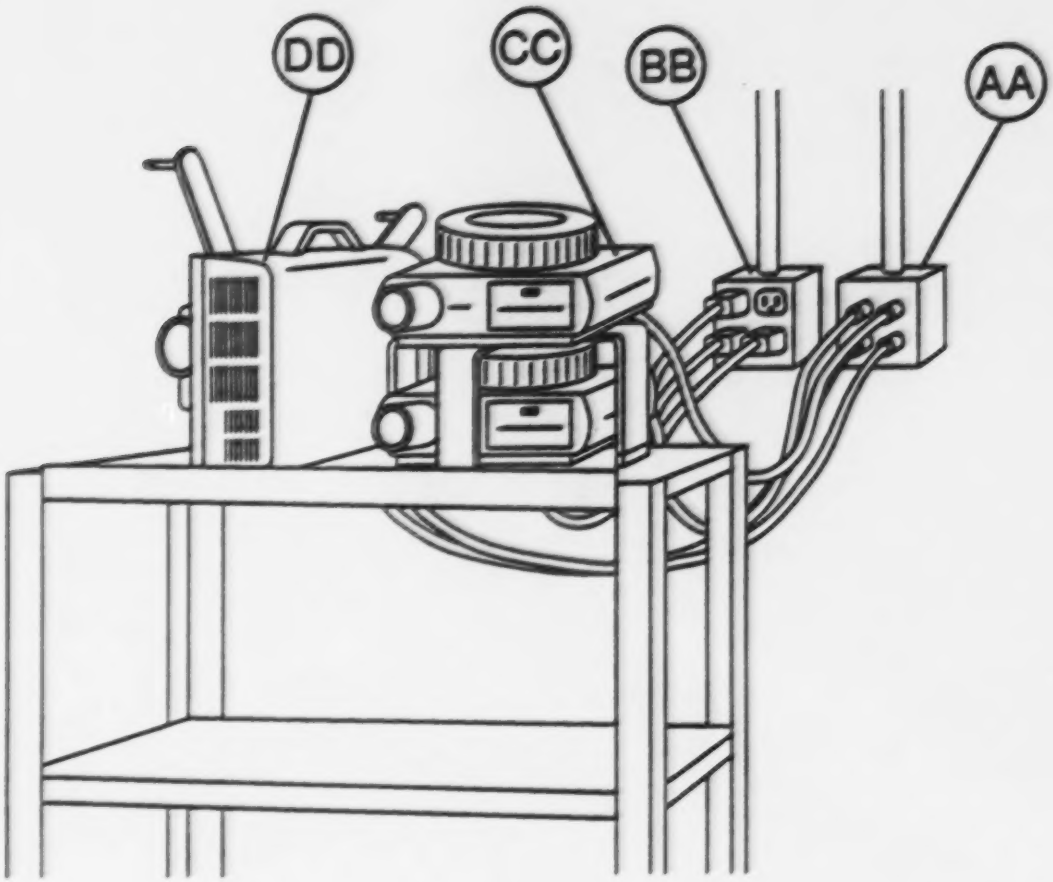


Figure 8

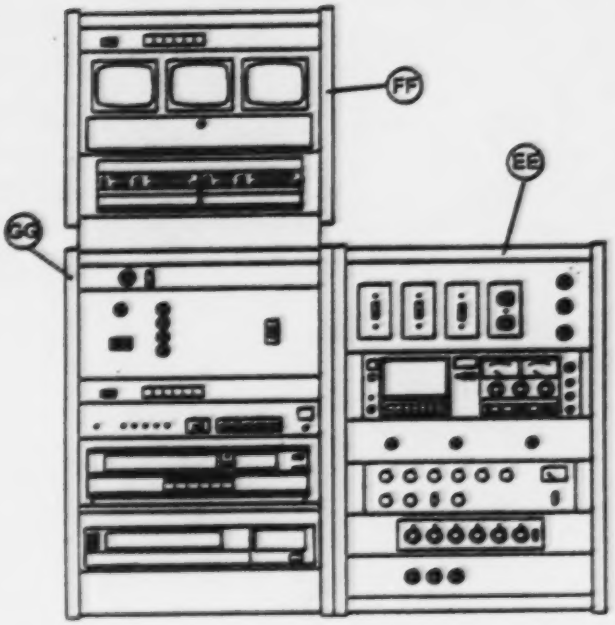
2.2 CLASSROOM DISPLAY/PROJECTION - COMPONENTS

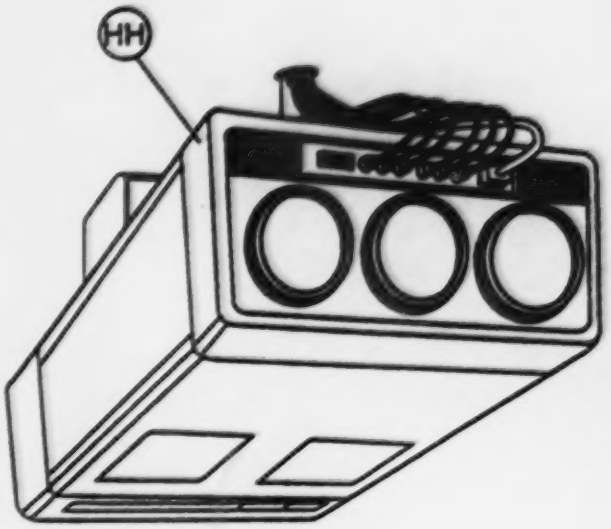


AA - Projector(s) remote control/audio inputs
BB - AC switched power - To switch (B) on front console
CC - Slide projectors
DD - 16 mm projector

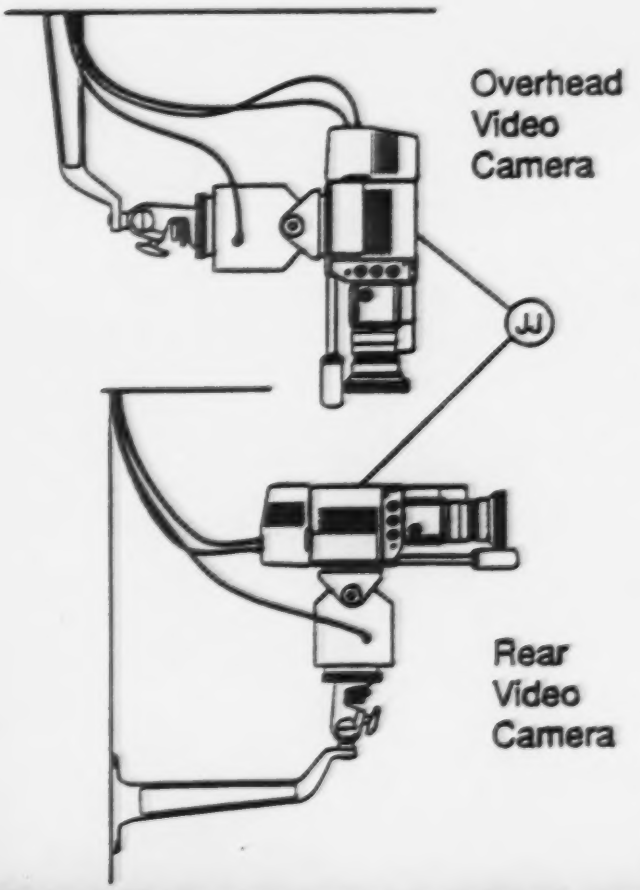
Figure 9

2.3 CLASSROOM VIDEO DISPLAY AND RECORDING - COMPONENTS





Video Projector



Video Monitor

Figure 10

2.4 COMPUTER INPUT/DISPLAY - COMPONENTS

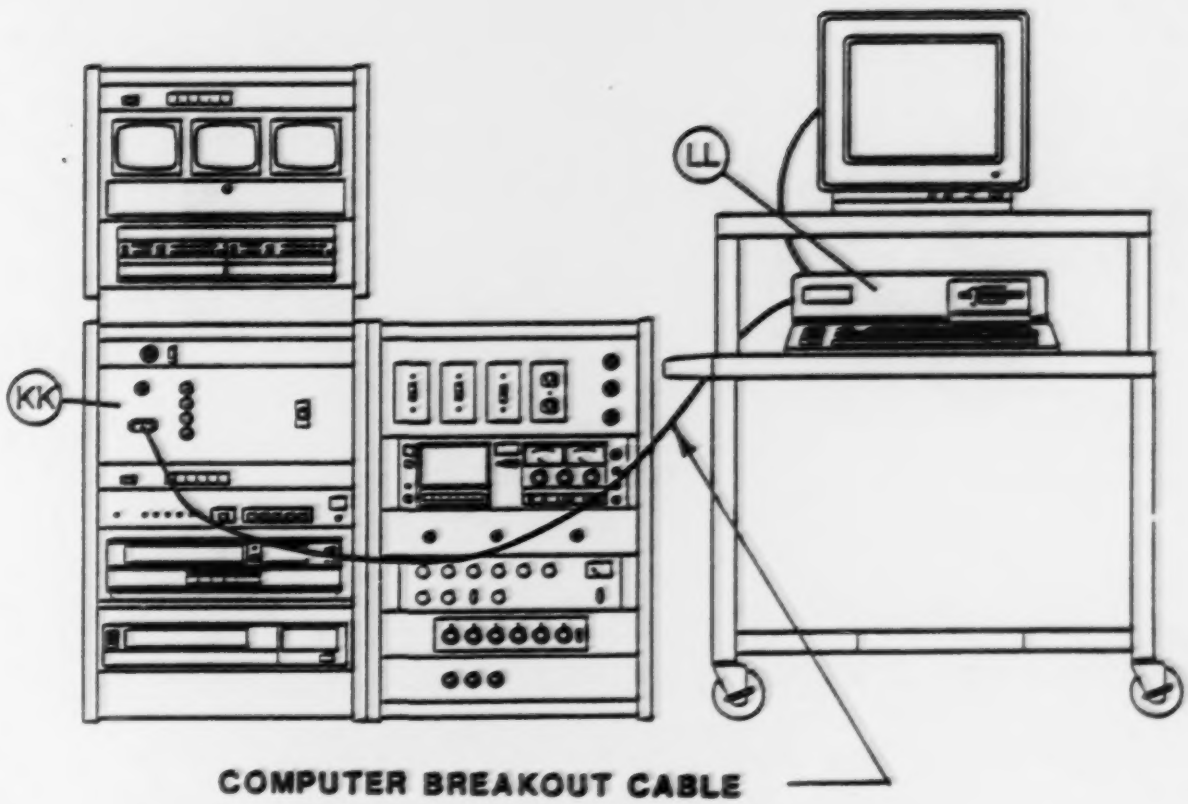


Figure 11

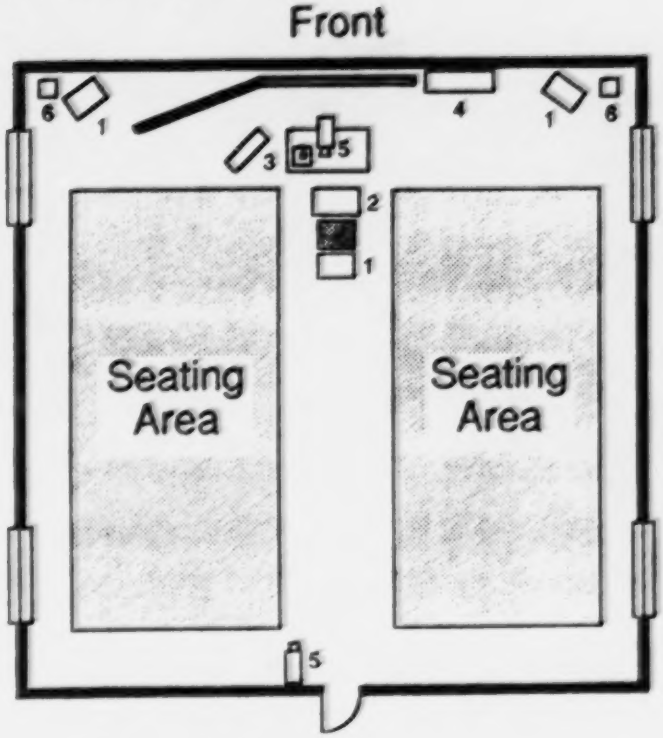
COMPONENTS IDENTIFICATION - SWOS CLASSROOM AUDIO-VISUAL SYSTEM

CODE	GENERAL FUNCTION	COMPONENT	MAKE & MODEL
(A)	Master AC power control	AC power panel	Winsted 98700
(B)	Switches AC power	Rear Proj. Console AC switch	---
(C)	Switches AC power	Video Monitor(s) AC switch	---
(D)	Auxiliary AC power	AC power outlets	---
(E)	Raise/lower screen	Electric proj. screen control	Da-Lite Cosmopolitan
(F)	Remote control input	16mm remote jack	Elki
(G)	Remote control input	Slide proj. remote jacks	Kodak
(H)	Audio playback/recording	Audio Cassette Deck	Tascam 112
(I)	Audio amplification controls	Mixer/Amplifier	TOA A903-A
(J)	Microphones level controls	Microphone Mixer	Shure M68A
(K)	Aux. audio input - line level	1/4 std. jack (audio panel)	---
(L)	Audio output - line level	1/4 std. jack (audio panel)	---
(M)	Audio input - 8 ohm level	1/4 std. jack (audio panel)	---
(N)	Microphone inputs	Microphone jack panel	---
(O)	Video projector controls	Video Proj. Remote Panel	GE Imager 300
(P)	Select video display source	Video Switcher #2	Panasonic WJ-220/WJ-225R
(Q)	Select video recording source	Video Switcher #1	Panasonic WJ-220R
(R)	View video source outputs	3-gang Monitor	Panasonic WV-5203B
(S)	Video camera controls	Video Camera Remote Controllers	Panasonic WV-CR12
(T)	VHS video playback	VHS Player	Panasonic AG-1150
(U)	VHS video recording	VHS Recorder	Panasonic AG-2500
(V)	9-pin computer input	DB-9 jack (video panel)	---
(W)	Composite video input	BNC jack (video panel)	---
(X)	RGB computer inputs	BNC jacks (video panel)	---
(Y)	Select monitor display source	Toggle switch (video panel)	---

CODE	GENERAL FUNCTION	COMPONENT	MAKE & MODEL
(AA)	Remote control/audio inputs	Remote Plugs - wall box (for rear proj. console)	---
(BB)	Switched AC power for rear projection	AC power outlets	---
(CC)	To project 35mm slide	Slide Projector	Kodak III-AMT
(DD)	To project 16mm film	16mm Projector	Elki ENT-0
(EE)	Instructor controls - front console	Audio & AC power components	Various
(FF)	Instructor controls - front console	Video Recording components	Various
(GG)	Instructor controls - front console	Video Display components	Various
(HH)	Display of video images on front screen	Video Projector	GE Imager 300
(II)	Display of video images	Video Monitors	NEC DM-2600A
(JJ)	Recording and display of instructional materials	Video Cameras (overhead & rear mounted)	Panasonic WV-D500X
(KK)	Instructor controls - front console	Video inputs & components	Various
(LL)	Generate EGA computer output	Computer	Zenith 248/12 PC

Figure 12

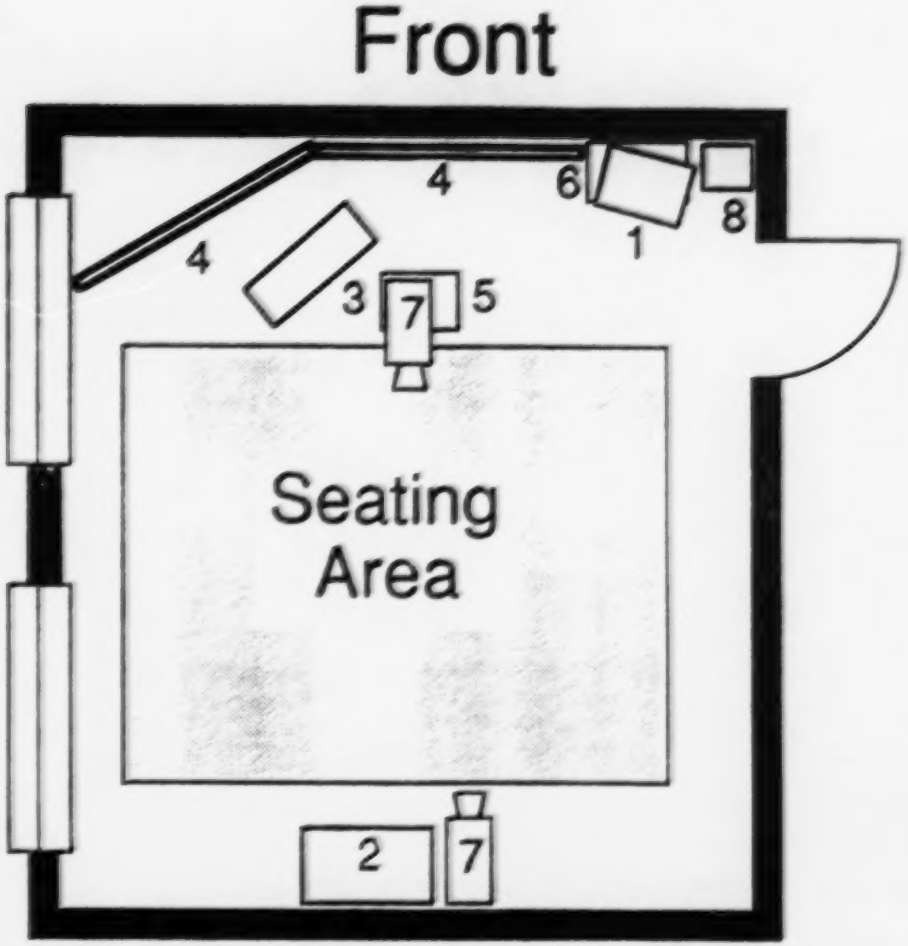
CATEGORY 2.



1. Video Monitors
2. Slide/film Projection Systems
3. Overhead Projection & Instructor Work Station
4. Control Console
5. Video Camera Location
6. Audio Speakers

Figure 13

Category #3: Seminar Room



1. Video Monitor
2. Slide/film Projector Console
3. Overhead Projector
4. Screens, 70" & 84"
5. Instructor Work Station
6. Control Console:
   - audio panel
   - slide/film remotes
   - video camera controls
   - VCR/VP
   - computer
7. Video Camera Locations
8. Audio Speaker

Figure 14

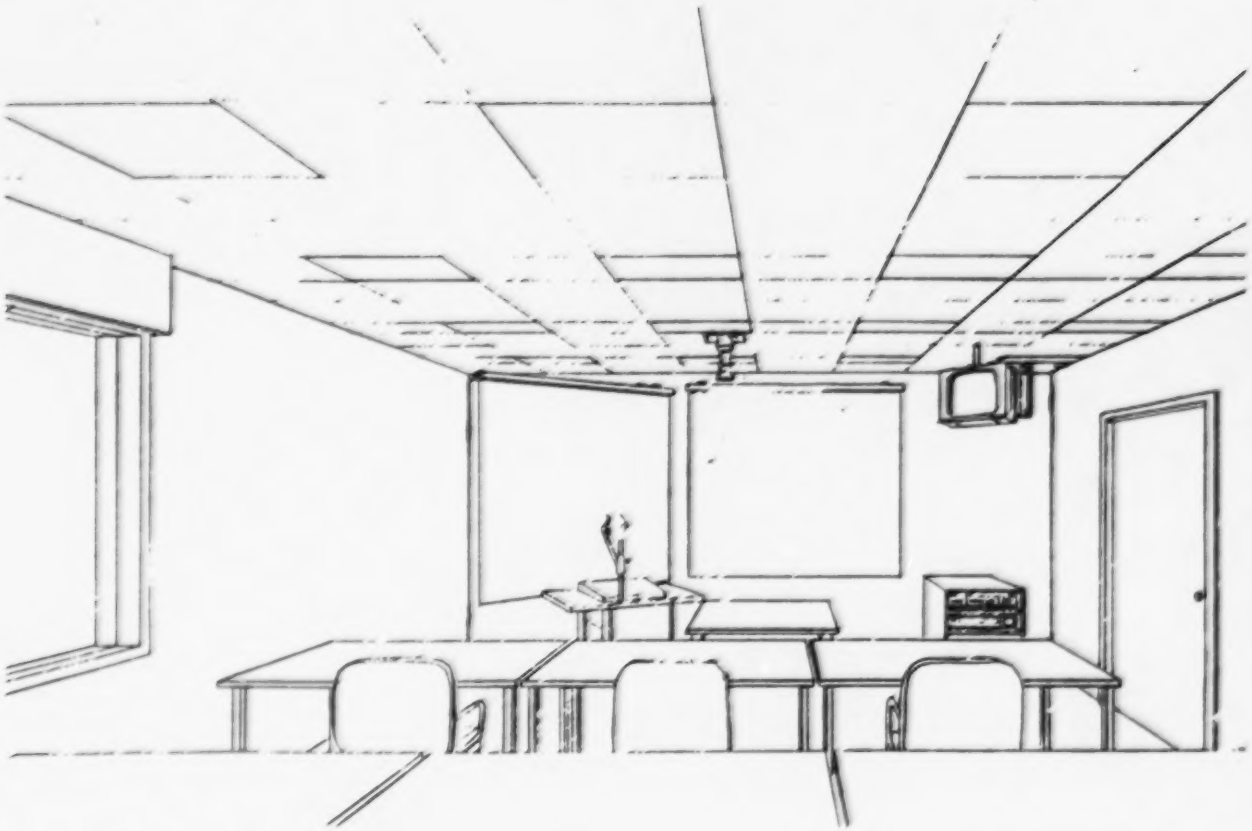
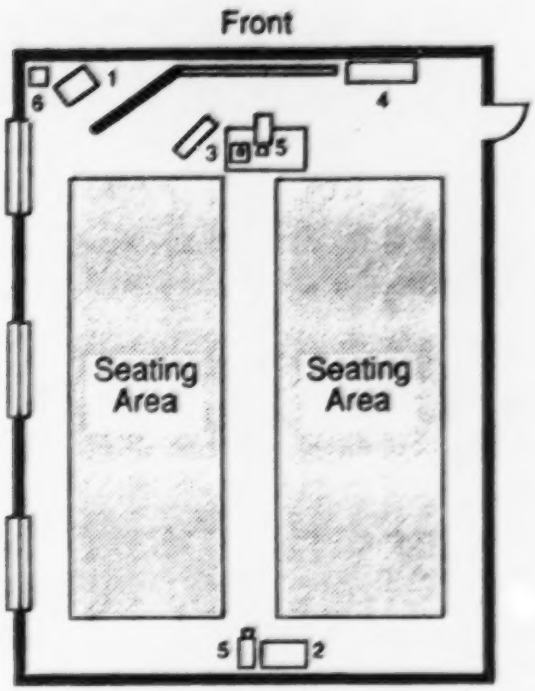


Figure 15

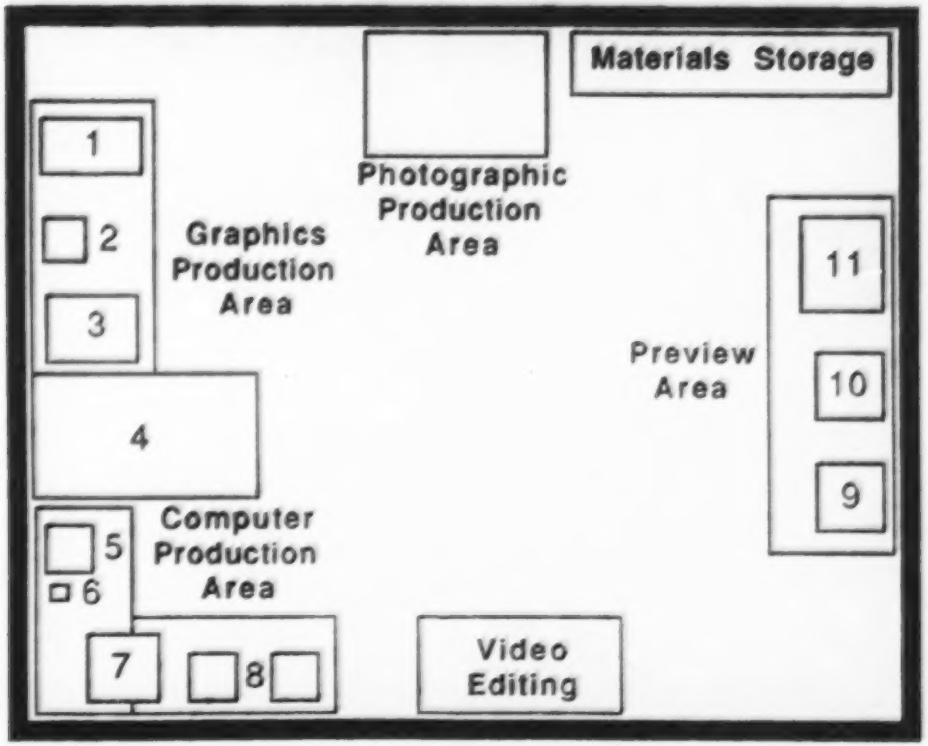
CATEGORY 4.



1. Video Monitors
2. Slide/film Projection Systems
3. Overhead Projection & Instructor Work Station
4. Control Console
5. Video Camera Location
6. Audio Speakers

Figure 16

Satellite Media Production Center (SMPC)



1. Laminator
2. TP Maker
3. Light Table
4. Layout & Drafting
5. Digitizer
6. Extension Drive
7. Laser Printer
8. Computers
9. Overhead
10. Slide/tape Preview
11. Video Player with T.V.

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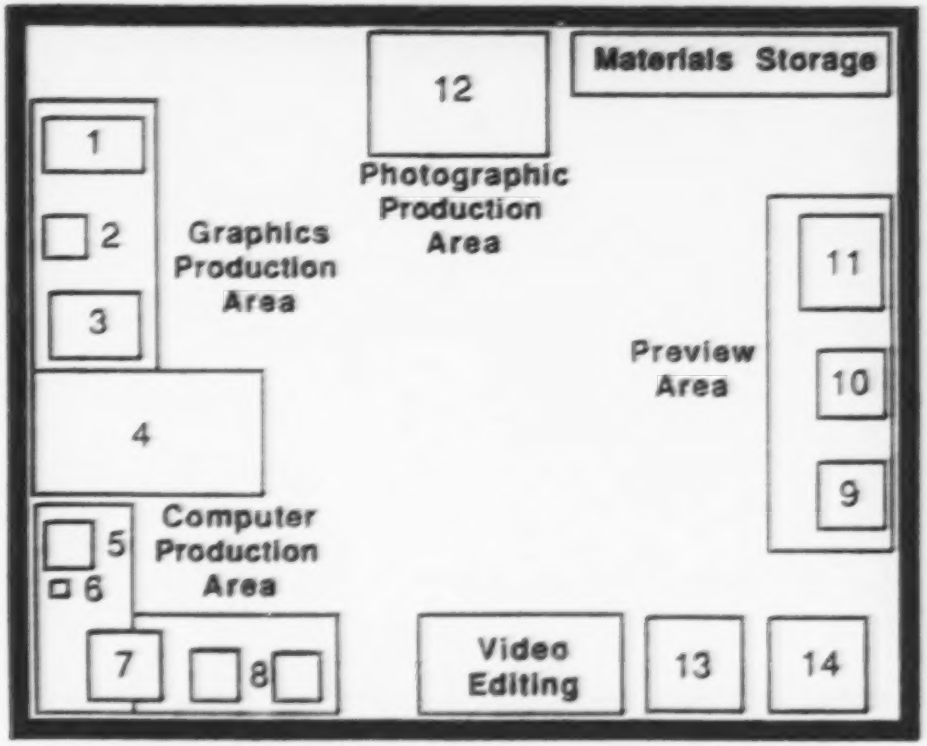
Figure 17

Prototype for the Central Media Production Center



1. Laminator
2. TP Maker
3. Light Table
4. Layout & Drafting
5. Digitizer
6. Extension Drive
7. Laser Printer
8. Computer
9. Overhead
10. Slide/tape Preview
11. Video Player with T.V.
12. Copystand
13. Film-Video Transfer
14. PAL and SECAM Video Tape Equipment

Table 1: Design Plan Evaluation - Classroom Systems

	Classroom Systems	Average Rating
A.*	1. Proposal systems seem compatible with classrooms?	1.9
	2. The centralized control console for the system is appropriate?	2.23
	3. The proposed design plan meets my expectations?	1.54
B.**	The level of sophistication of the proposed systems seems:	6.31
C.***	Overall, I feel classroom presentation needs are being met.	2.09

---

* 14 Point Likert Scale Used	** 14 Point Likert Scale Used	*** 14 Point Likert Scale Used
1 = strongly agree	1 = too high	1 = very adequately
4 = agree	4 = high but reachable	4 = adequately
10 = disagree	7 = about right	10 = inadequately
14 = strongly disagree	10 = low	14 = very inadequately
	14 = too low	

Table 2: Design Plan Evaluation - Media Centers

	Classroom Systems	Average Rating
A.*	1. The proposal appears to provide adequate support?	4.0
	2. The proposed design plan meets my expectations?	2.75
B.**	The level of sophistication of the proposed systems seems:	6.17
C.***	Overall, I feel media production needs are being met.	2.75

---

* 14 Point Likert Scale Used
1 = strongly agree
4 = agree
10 = disagree
14 = strongly disagree

** 14 Point Likert Scale Used
1 = too high
4 = high but reachable
7 = about right
10 = low
14 = too low

*** 14 Point Likert Scale Used
1 = very adequately
4 = adequately
10 = inadequately
14 = very inadequately

Table 3: Evaluation of the Four Prototype Classroom Installations

	Question	Average Rating
A.*	1. Layout of the console is logical.	4.2
	2. Equipment pieces are easy to use and control.	3.2
	3. The prototypes perform adequately.	2.9
	4. The range of functions meets my expectations.	2.4
	5. The prototypes are a significant improvement over previous systems.	2.0
	6. The classroom-users manual is useful.	2.6
B.**	How often do you expect to use:	
	1. Screen projection equipment	1.4
	2. Audio playback and recording	5.6
	3. Video playback	2.8
	4. Video recording	3.3
	5. Computer display	5.1

---

* 14 Point Likert Scale Used

1 = strongly agree

4 = agree

10 = disagree

14 = strongly disagree

** 14 Point Likert Scale Used

1 = high use

4 = occasional use

10 = seldom use

14 = never use

END

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March 21,1991